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EXAMINER

CARIASO, ALAN B

ART UNIT

PAPER NUMBER

2875

DATE MAILED: 07/15/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/888,530

Applicant(s)

UMEMOTO ET AL.

Examiner

Alan Cariaso

Art Unit

2875

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 24 April 2003.
- 2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-4,6-16 and 18-24 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 6 is/are allowed.
- 6) ☒ Claim(s) 1-4,7-16 and 19-24 is/are rejected.
- 7) ☒ Claim(s) 18 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☒ The proposed drawing correction filed on 24 April 2003 is: a) ☒ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Response to Amendment

Drawings

1. The proposed drawing correction and/or the proposed substitute sheets of drawings, filed on April 24, 2003 have been approved. A proper drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The correction to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-4 and 7-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over MASUDA et al (US 6,340,999 B1) in view of YANG (US 6,108,059).

4. In regards to claims 1-4, 7-9, 11 and 12: MASUDA discloses a plate-like member (light guide 3; figs.1,9,10) including light output means (3d,3e,3f;fig.1) formed in an upper surface (3c) of the plate-like member (3) so that light incident on an incidence side surface (3a) of the plate member (3) is exited from a lower surface (3b) of the plate-like member (3) through the output means (figs.1,9,10); an adhesive layer (10 or 10a; figs.1,9,10) having a refractive index lower ($n=1.38$; col.15, lines 34-39; col.17, lines 25-29) than that of the plate member ($n=1.49$, col.15, line 39); and an anti-

Art Unit: 2875

reflection layer (8,fig.9; col.14, lines 34-41) made of a circular polarizer (4, col.11, lines 24-50) and bonded to a lower surface (3b) of the plate member (3) through the adhesive layer (10,10a); wherein the anti-reflection layer (4,8) made of circular polarizer (4) includes a quarter-wave plate (4c), a half-wave plate (4b), and a linear polarizer (4a, col.11, lines 40-44); wherein a maximum intensity of light exited from the lower surface of the plate member in terms of a plane perpendicular to reference planes of both the lower surface and incidence side surfaces is inclined at an angle of not larger than 30 degrees with respect to a normal to the reference plate of the lower surface (fig.4A); wherein the light output means (3f) formed in the upper surface (3c) of the plate member (3) is formed by a repetitive structure of prismatic structures (3d,3e) each shaped like a triangle in section (fig.1) and each having an optical path changing face (3e) inclined at an inclination angle with respect to the reference plate of the lower surface (3b); wherein ridgelines (vertex between 3d or 3e in fig.2) of the prismatic structures (3f) are inclined within a range of ± 30 degrees (shown as 23 degrees in fig.2; col.13, lines 48-54; col.14, lines 14-18) with respect to the reference plane of the incidence side surface (3a); wherein the refractive index of the adhesive layer (10,10a) for bonding the anti-reflection layer (4,8) to the lower surface (3b) of the plate member (3) is lower than the plate member (3) by 0.01 or more (col.16, lines 10-12); wherein the refractive index of the adhesive layer to the lower surface of the plate member is not higher than 1.47 (col.16, lines 23-25, $n=1.38$); wherein a plane light source unit (1,fig.1) comprises a light source (2) being disposed on one side (3a,fig.1) of a light pipe (3) defined in claim 1; wherein a reflection type liquid-crystal display device (5,fig.1) having

Art Unit: 2875

a cell (5a,6,7,5b,fig.1) including a reflection layer (7) is disposed on a light exit side (3b) of a plane light source (1) unit defined in claim 11.

5. However, MASUDA does not disclose the inclination angle of the optical path changing face (3e) that includes the range of 35 to 48 degrees with respect to the reference plate of the lower surface (3b). YANG teaches a slant angle of 45 degrees (col.10, lines 10-19) that define the inclination of slant portions (21-figs.8,9A,9B) for the purpose of internally reflecting light guided by the light guide plate (20) towards an oppositely position reflective LCD panel (0) thereby visibly illuminating the LCD panel. It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide the plane light source unit or light guide plate with the inclined optical path changing face of MASUDA et al including an inclination angle of at least 45 degrees as taught by YANG within the claimed range in order to internally reflect guided light outward from the light guide towards the adjacent LCD panel.

6. In regards to claim 10, MASUDA discloses applicant's claimed invention except the adhesive layer being constituted by a tacky layer. It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide the plane light source unit with the adhesive layer (10,10a) constituting a tacky layer since it was known in the art that a tacky layer or substance is an art-equivalent reference to an adhesive substance.

Art Unit: 2875

7. Claims 13, 14, 16 and 22-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over IWAMOTO et al (US 5,046,826) in view of CIUPKE et al (US 5,461,547).

8. IWAMOTO discloses a light pipe comprising: a plate-like member (1303-fig.13) including light output means (1305) formed in a lower major surface of the plate-like member (1303) so that light incident on an incidence side surface (side(s) adjacent the light source(s) 1301,1302) of the plate-like member (1303) is exited from an opposite upper surface (1304-fig.13) of the plate-like member (1303) through said light output means (1305); a light-diffusing layer or film (1306) bonded to the upper surface of the plate-like member through said adhesive layer; given the structure of plate-like member (1303) and the illustrated light exiting in a substantially direction normal or within an acute angle normal to lower and upper surfaces of the plate-like member, an inherent maximum intensity of light exits in that direction; wherein the light output means (1305) is constituted by a plurality of sectionally triangular prismatic structures (fig.13) having optical path changing faces inclined at an inclination angle; wherein at least one light source (1301-fig.1) is disposed on one side surface of the light pipe.

9. However, IWAMOTO does not disclose: a range of 35 to 48 degrees defining the inclination angle of the optical path changing faces inclined with respect to a reference plane of the lower surface; the light output means formed in an upper surface of the plate-like member and light exiting from a lower surface of the plate-like member; an adhesive layer having a refractive index lower than that of the plate-like member bonded to and between the light-diffusing layer and the lower surface of the plate-like

Art Unit: 2875

member; the light-diffusing layer including fine prismatic structures formed in a surface thereof; the direction of maximum intensity of exiting light of the plate-like member being within 30 degrees with respect to a normal of the reference plane of the lower surface; the adhesive layer constituting a tacky layer; and a reflection type liquid-crystal display device.

10. In regards to the inclination angle range of 35 to 48 degrees, CIUPKE teaches facets (16) of grooves (17) having inclination angles in the range of 45-55 degrees (col.2, lines 53-56) with respect to a direction perpendicular to the light pipe or guide (11), also meaning 35-45 degrees angular range with respect to a reference plane of the lower or upper major surfaces (13,14), for the purpose of internally reflecting internal light rays (26-fig.2) to exit out of the light guide toward the adjacent panel (12) to be illuminated. It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide the light guide device with surface structures or grooves of IWAMOTO et al to include inclination angles of 35-45 degrees with respect to a reference plane of the lower or upper major surfaces of the light guide as taught by CIUPKE in order to effectively extract light from the light guide and illuminate the adjacent panel.

11. In regards to the light output means formed in an upper surface and light exiting from a lower surface of the plate-like member and to the reflection type liquid-crystal display device, CIUPKE teaches grooves (17-fig.5) formed on the upper surface (14-fig.5) of the light guide (11) and light exiting from a lower surface (13-fig.5) of the light guide (11) for the purpose of illuminating a display panel (12) of a reflection type (32-

fig.5; col.3, lines 49-58) positioned adjacent the lower surface (13). CIUPKE further teaches that the forming and placement of the grooves (17) on either the bottom surface (14-figs.2-4) or the upper surface (14-fig.5) are for the purposes of backlighting a light transmitting LCD and front lighting a reflective-type LCD (32), respectively. It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide the light guide device with surface structures or grooves of IWAMOTO et al formed on either one of the upper or bottom surfaces as taught by CIUPKE et al in order to make the light guide or plate-like member versatile in use to either backlight a light transmitting LCD and a reflective LCD.

12. In regards to the adhesive layer, IWAMOTO teaches an adhesive layer having a smaller refractive index than the PMMA material of light-transmitting member (1402-1, 1402-2; fig.6) for the purpose of preventing cross-talk (col.2, lines 1-10) between the light-transmitting or light-guiding sheets (1407), and having an adhesive (104) bonding a light scattering or diffusing layer (104-fig.1; col.5, lines 34-37) to a light output surface of light transmitting member (102-1,102-2; fig.1) for the purpose of positioning the diffusing layer on the light output surface of the light guide so as to diffuse output light extracted by oppositely positioned light output means (102-1,102-2,107-1,107-2). It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide the light pipe device (fig.13) of IWAMOTO including an adhesive layer of lower refractive index (than the plate-like member or light guide) bonding the light-diffusing layer to the output surface of the plate-like member as taught by IWAMOTO in order to substantially propagate light received from the edge or side surface through the

Art Unit: 2875

length of the light guide or plate-like member by internal reflection until the light is extracted by light output means toward the output surface to be diffused by the light-diffusing layer toward the display to be uniformly illuminated.

13. In regards to the light-diffusing layer including fine prismatic structures, IWAMOTO teaches a diffusion sheet (104) including a roughened surface or particles (col.5, lines 28-32) which define such prismatic structures for the purpose of diffusing output light from the plate-like member (102,108). It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide the light pipe device (fig.13) of IWAMOTO including roughened or prismatic structures of the light-diffusing layer as taught by IWAMOTO in order to uniformly illuminated the display.

14. In regards to the direction of maximum intensity of exiting light of the plate-like member being within 30 degrees with respect to a normal of the reference plane of the lower surface, it would have been obvious to one having ordinary skill in the art at the time the invention was made to form the light pipe device of IWAMOTO exiting or emitting light in a direction 30 degrees with respect to a normal to the reference plane of the lower or major surface of the plate-like member, since it has been held (In re Antonie, 559 F.2d 618, In re Boesch, 617 F.2d 272) that discovering an optimum value of a result effective variable involves only routine skill in the art. One would have been motivated to form applicant's light pipe device to form its maximum intensity of output light exiting in the direction within the chosen optimal range of 30 degrees for the purpose of efficiently illuminating the adjacent display.

Art Unit: 2875

15. In regards to the adhesive layer constituting a tacky layer, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide the plane light source unit with the adhesive layer (10,10a) constituting a tacky layer since it was known in the art that a tacky layer or substance is an art-equivalent reference to an adhesive substance.

16. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over IWAMOTO et al (US 5,046,826) in view of CIUPKE et al (US 5,461,547) as applied to claims 13, 14, 16 and 22-24 above, and further in view of YAMAMOTO et al (US 5,341,231).

17. IWAMOTO (fig.13) modified above discloses applicant's claimed invention except an anti-reflection layer provided on the fine prismatic-structure layer of the light diffusing layer. YAMAMOTO teaches a light pipe or light plate member (161-fig.10) with either or both upper and lower surfaces (161a,161b) coated with an anti-reflection film (col.13, lines 42-46) for the purpose of inducing total internal reflection and preventing scratches. It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the light pipe device of IWAMOTO et al to include the type of anti-reflection layer(s) on at least the light pipe major surface as taught by YAMAMOTO and associated with an adjacent light-diffusing layer in order to induce total internal reflection in the light pipe and prevent scratches of the prismatic surface of either light plate member and/or the light diffusing layer.

18. Claims 19-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over IWAMOTO et al (US 5,046,826) in view of CIUPKE et al (US 5,461,547) as applied to claims 13, 14, 16 and 22-24 above, and further in view of MASUDA et al (US 6,340,999).

19. IWAMOTO (fig.13) modified above discloses applicant's claimed invention except: ridgelines defining edges of the optical path changing faces in a range of ± 30 degrees with respect to a reference plane of the incidence side surface; the refractive index of the adhesive layer being lower by a value of 0.01 to 0.2 than that of the plate-like member; and the refractive index of the adhesive layer not being higher than 1.47.

20. MASUDA teaches ridgelines or edges (defined by each vertex between 3d or 3e in fig.2) of the prismatic structures (3f) inclined within a range of ± 30 degrees (shown as 23 degrees in fig.2; col.13, lines 48-54; col.14, lines 14-18) with respect to the reference plane of the incidence side surface (3a) for the purpose of preventing second brightness fringe. It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the prismatic light pipe device of IWAMOTO having the ridgelines of the prisms oriented within ± 30 degrees with respect to the reference plane of the light incidence side surface as taught by MASUDA in order to prevent second brightness fringe.

21. MASUDA further teaches the refractive index of the adhesive layer being lower by a value about 0.2 or less than that of the plate-like member (col.15, lines 9-22) and not being higher than 1.47 (col.16, lines 23-28) for the purpose of minimizing surface reflection (col.16, lines 9-14) between the adhesive or refractive layer and the light

Art Unit: 2875

output surface of the light guide. It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the prismatic light pipe device of IWAMOTO to include the limited difference in refractive indices of the adhesive and plate-like plate as taught by MASUDA in order to minimize surface reflection.

Allowable Subject Matter

22. Claim 6 is allowed.

23. Claim 18 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response to Arguments

24. Applicant's arguments, filed April 24, 2003, with respect to the rejection of at least claim 1 under MASUDA (US 6,340,999) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of YANG (US 6,108,059). Applicant has stated that MASUDA does not expressly disclose the inclination angle range defined by claim 1, and that the reference does not disclose that the drawings are to scale and is silent as to dimensions, therefore they do not define the precise proportions or dimensions of the illustrated elements. In rebuttal, such a claimed range of the inclination angle (35-48 degrees) of the optical path changing face is considered to be a broad range defining acute angles which appear to be illustrated by the surface

structures of MASUDA. It is well known in refractive/reflective optics to include surface structures or faces with acute angles of at least 45 degrees relative a plane defining the major surface of the light guide plate that encompasses less than a critical angle(s) that still internally reflect the guided light but at a steeper or more acute angle relative a normal of the light guide plate so as to surpass the critical angle of incidence allowing passage or refraction through the opposite border plane surface so as to extract light from the light guide generally for illumination of an adjacently positioned display (LCD). The reference to YANG has been provided to support that teaching.

25. Applicant's arguments with respect to the rejection of at least claim 13 now amended to include the inclination angle range of 35 to 48 degrees of cancelled claim 17 have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of CIUPKE et al (US 5,461,547). Applicant has stated that IWAMOTO does not expressly disclose the inclination angle range defined by claim 13, and that the reference does not disclose that the drawings are to scale and is silent as to dimensions, therefore they do not define the precise proportions or dimensions of the illustrated elements. In rebuttal, such a claimed range of the inclination angle (35-48 degrees) of the optical path changing face is considered to be a broad range defining acute angles which appear to be illustrated by the surface structures of IWAMOTO. The reference to CIUPKE adequately teaches inclination angle range of at least within 35-45 degrees relative a plane defining the major surface of the light guide plate

Art Unit: 2875

allowing extraction of light from the light guide to illuminate an LCD panel by way of backlighting or front lighting.

Conclusion

26. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alan Cariaso whose telephone number is (703) 308-1952. The examiner can normally be reached on 9-5:30 M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sandra O'Shea can be reached on (703) 305-4939. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9318 for regular communications and (703) 872-9319 for After Final communications.

Art Unit: 2875

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.



Alan Cariaso
Primary Examiner
Art Unit 2875

AC
July 14, 2003